

# Comparison of cost and outcomes between hospital districts

*EUPHA preconference:*

**COMPARATIVE RESEARCH DESIGNS IN THE STUDY OF  
HEALTH CARE SYSTEMS**

Unto Häkkinen

# Health care system in Finland

Universal and equal availability

Public financing

- 8.9 (7.5)% of GDP (2005)
- 75% public funding
- also some 40% of private services are reimbursed

Government

- soft regulation / information guidance

**Municipalities**

- responsible for providing health services. About 430 with a population range from 560 000 to just 150. (44 have decided to merge and additional 90 are considering merging)

20 + 1 Central **Hospital Districts** (owned federations of municipalities). About 50 somatic acute hospitals

# Information system in Finland

- Finland has one of the world's most advanced systems of collecting and disseminating social welfare and health care statistics
- Most statistics are based on registers
- Registers are based on unique personal identification numbers (1964-67 onwards)
- Data collection is patient-related, not related to insurance or service provider
- Population- based analyses are feasible

# **PERFECT**

## **PERFormance, Effectiveness and Cost of Treatment episodes**

<http://info.stakes.fi/perfect/EN/index.htm>

Research Consortium : Stakes, five university  
hospitals and the Social Insurance Institution  
Research Programme on Health Services Research  
- Tervtu, Finnish Academy  
FinWELL – Tekes  
The Finnish Innovation Fund  
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Commission

# The **GENERAL AIM** Of **PERFECT**

To develop methods for register-based measurement of the cost-effectiveness of treatment and to create a comparative database that allows the treatments given and their costs and effectiveness to be compared between hospitals, hospital districts, regions and population groups.

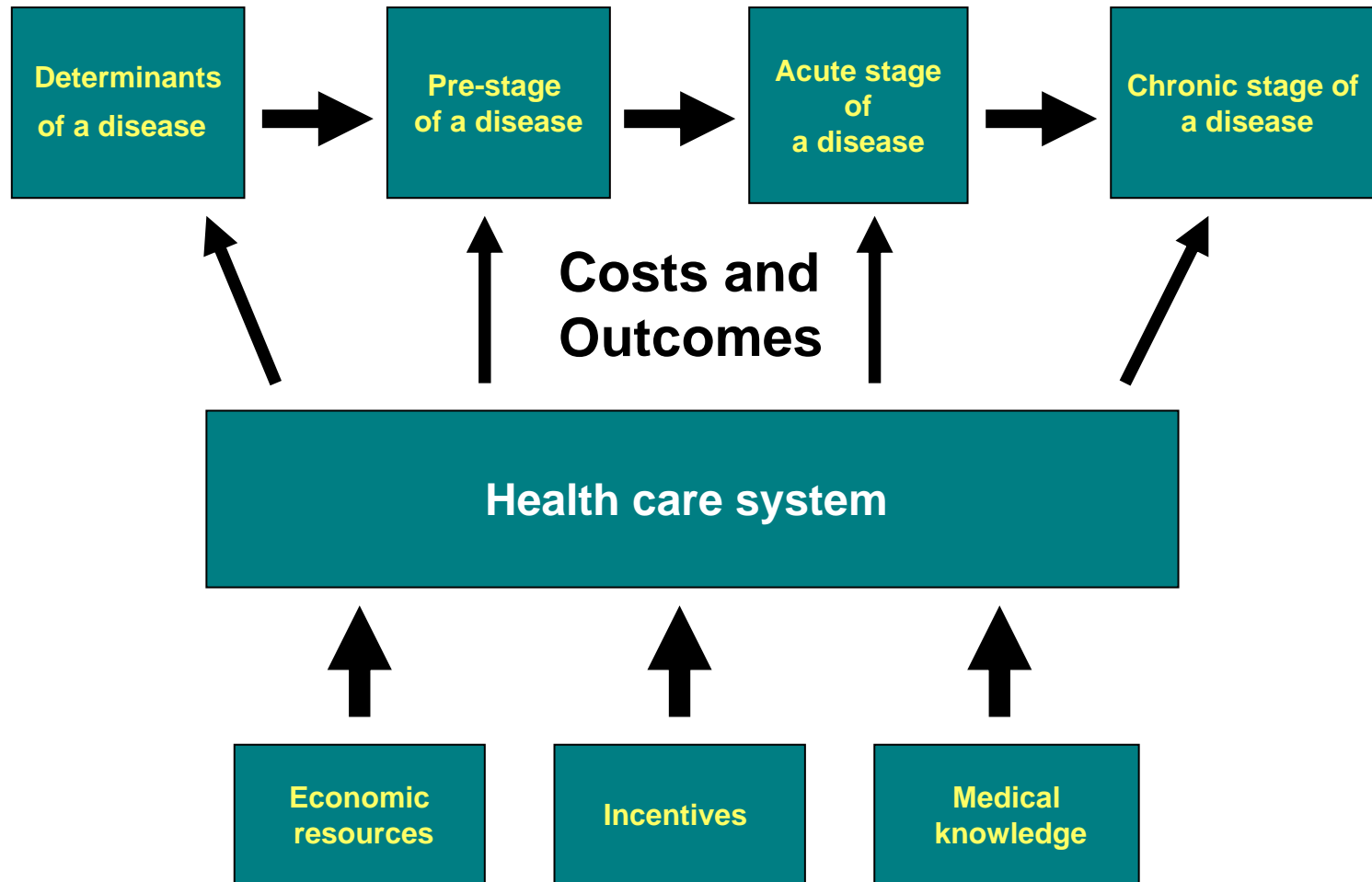
# PERFECT

- Produces comparative information on treatments and their costs and effectiveness for treatment monitoring and development.
- Creates indicators and models for monitoring the content, quality and cost-effectiveness of treatment episodes in specialised medical care.
- Assesses factors that influence cost-effectiveness.
- Develops methods for the register-based measurement of cost-effectiveness, and comes up with proposals concerning the data content of national level registers in order to improve the continuous monitoring of cost-effectiveness.
- Develops an approach and methodology that can be subsequently applied to other disease groups as well.
- Compares cost-effectiveness at an international level

# Population based cost effectiveness approach (microeconomic disease-based strategy)

Based on modelling the natural progress of a disease, with specific interest in the role of health services as a determinant in the progress.

Uses data from registers on individual patients.



# PERFECT - disease groups

The focus will be on selected disease groups with sufficient significance in terms of costs and burden of illness:

- Acute myocardial infarctions, extended later to revascular procedures (CABG, PTCA)
- Hip fracture
- Breast cancer
- Hip and knee replacements
- Very low birth weight infants
- Schizophrenia
- Stroke

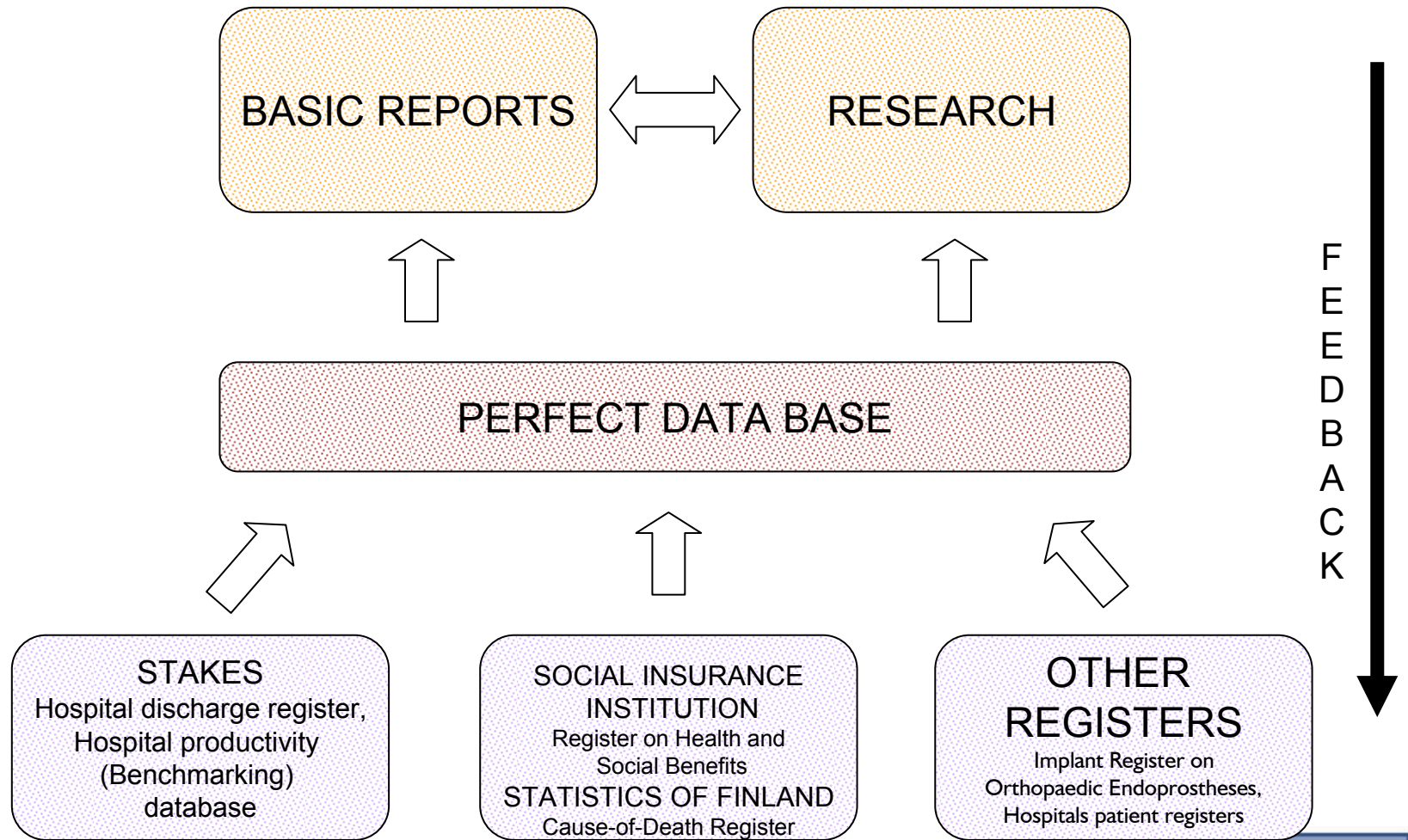
# Organisation of the Project

Each subprojects has own expert group, together 50 clinical experts

- Develop the disease/health problem specific protocols
- Define the content of data
- Is responsible for basic reports
- Aims to do international comparison

Stakes / CHESS is responsible for overall coordination of the project, gathering and analysing the data and for health economic, health service research and statistical expertise

## Description of PERFECT-Project



# Content of basic reports (available in web)

## Levels

- **Hospital Districts** (responsible for providing specialist care in Finland) based on the municipality of the patient)
- **Hospital** (over 50 patients), based on patients treated in a hospital

## Indicators

1. Basic information on patients
  - Number of patients, age structure, co-morbidity
2. Indicators describing length of stay, outpatient visits, use of procedures, drugs, cost of care. Process indicators such as per cent of patients treated in specific high quality units.
3. Indicators describing outcome of patients

# Current status of Project

- **Acute myocardial infarction** (regional level data available from the years 1998-2003)
- **Bypass surgery and PTCA** (regional and hospital level data under development from years 1998-2005)
- **Hip Fracture** (regional and hospital level data available from years 1998-2003, not yet published)
- **Breast cancer** (regional level data under development from years 1998-2001)
- **Hip and knee replacements** (regional and hospital level data available from years 1998-2003)
- **Very low birth weight infants** (regional and hospital level data available from years 2000-2003)
- **Schizophrenia** (regional and hospital level data available from years 1995-2000, not yet published)
- **Stroke** (regional and hospital level data available from years 1998-2003)

**Updating the data for years 2004 and 2005 by the end of 2007**

# Key questions

- Definition of an episode: When it starts and when it finishes (follow up time)?
- Balancing: what can be done on routine basis with scientific/methodological aspects

# Methodological challenges of health economic register-based studies on cost-effectiveness of treatment episodes

- I. **Case-mix adjustment and/or eliminating selection bias (problems encountered in the analysis of causal effects with non-experimental data)**
  - Observable confounders : standardisation (modelling, nonlinear regression, propensity score, confidence intervals using shrinking etc.)
  - Unobservable confounders : Instrumental variable methods, two-stage methods etc.

# Solutions used in basic reports

## 1) A definition of patient group so that that they are as comparable as possible

### Examples

- New hospitalised **AMI** (ICD-10 I21-I22) aged 40-85: Patients were excluded if
  - i) they were discharged alive and had a length of stay, including transfers, of less than 3 days,
  - ii) they had been hospitalised for AMI during the previous year (365 days)
  - iii) if they were institutionalised before hospital admission for AMI
- **Stroke.** First ever stroke and not institutionalised

## 2) Risk adjustment for co morbidity using information on previous use of hospital inpatient care (since 1987), registered individuals suffering from certain specified chronic conditions (Social insurance institution) and purchases of prescribed medicines

## 3) Standardising by modelling and calculation of confidence intervals

<b>Co-Morbidity</b>	<b>Previous use of hospital care ICD-9</b>	<b>Previous Use of hospital inpatient care ICD-10</b>	<b>Registered individuals suffering from certain specified conditions, Social insurance institution (code)</b>	<b>Use of Prescribed Drugs ATC-code</b>
Hypertension	40*	I10*-I15*	205	C03*, C07*, C08*, C09*
Coronary heart disease	410*-414*	I20*-I25*	206	
Atrial fibrillation	4273*	I48*	207	
Heart failure	428*	I50*	201	
Diabetes	250*	E10*-E14*	103	A10A*, A10B*
Alcoholism	291*, 304*-305*	F10*-F19*		
Peripheral atherosclerosis	440*	I70*		
Cancer	140*-208*	C00*-C99*, D00*-D09*	115,116,117,128,130,180,184,185,189,311,312,316	L01* except L01BA01 (Trexan)
COPD and Asthma	4912*, 496*, 493*	J44*-J46*	203	R03*
Dementia	290*, 3310*	F00*-F03*, G30*	307	N06D*
Depression	2960*, 2961*, 2069*	F32*-F34*	N/A	N06A*
Parkinson' disease	332*	G20*	110	N04B*
Psychosis	295*-298* except coded for depression	F20*-F31*	112,188	N05A* except (N05AB04 (Stemetil) & N05AB01 (Esucos))
Use of Statin				C10AA*
Use of Varfarin				B01AA03

# Methodological challenges (continued)

## 2. Measurement of outcome

- Traditional measures (various measures of mortality or intermediate indicators such as complications, hospital infections, medical errors, readmissions, transfers to long-term care and patients' ability to work)
- Specific aim is to reduce the gap between the traditional crude outcome measures (available in register data) and the ideal QALY based measures
  - Development of methods for combining various available outcome measures and other clinical data into a single measure. Validating against the QALY-type measures (for example, the 15D) and development of crosswalks from registers to quality of life measures.

## Solutions in basic reports

So far mostly risk adjusted traditional measures (7 day, 30 day, 1 and 5 year) mortality, infections, readmissions, reoperations, days until return to home. days spent at home in a given during follow up

## Methodological challenges (continued)

### 3. Measurement and analysis of costs

- Developments of approaches for estimating patient level costs for all individual activities available in registers
  - Utilising patient groupings (e.g. DRG, RUG), standard costs, available patient-level cost, procedure and price information

## Solutions in basic reports

- Development of standard (relative) cost for each outpatient visit and inpatient discharge in the database. Based on patient level cost data in one hospital district.
- Assumes that unit cost of producing specific procedures or DRGs are same all over country
- Cost of prescribed drugs based on their retail prices

## Methodological challenges (continued)

### 3. Measurement and analysis of costs (continued)

- Development of a framework for defining the scope of costs (societal costs, total costs/disease specific costs, the time dimension of costs, etc.) and ways how to estimate these using register data
- Econometrics of costs: functional form (linear, log, box-cox transformation, GLM modelling), distribution (skewed and censoring) while controlling for various aspects of patient selection.

# Solutions in basic reports

- Cost and utilisation data for all inpatient care, outpatient visits in specialised care and private doctors' visits and prescribed medicines
- Standardisation modelled using GLM (log link with gamma distribution). Two or three part model for cost of prescribed medicines

# Examples of the PERFECT project:

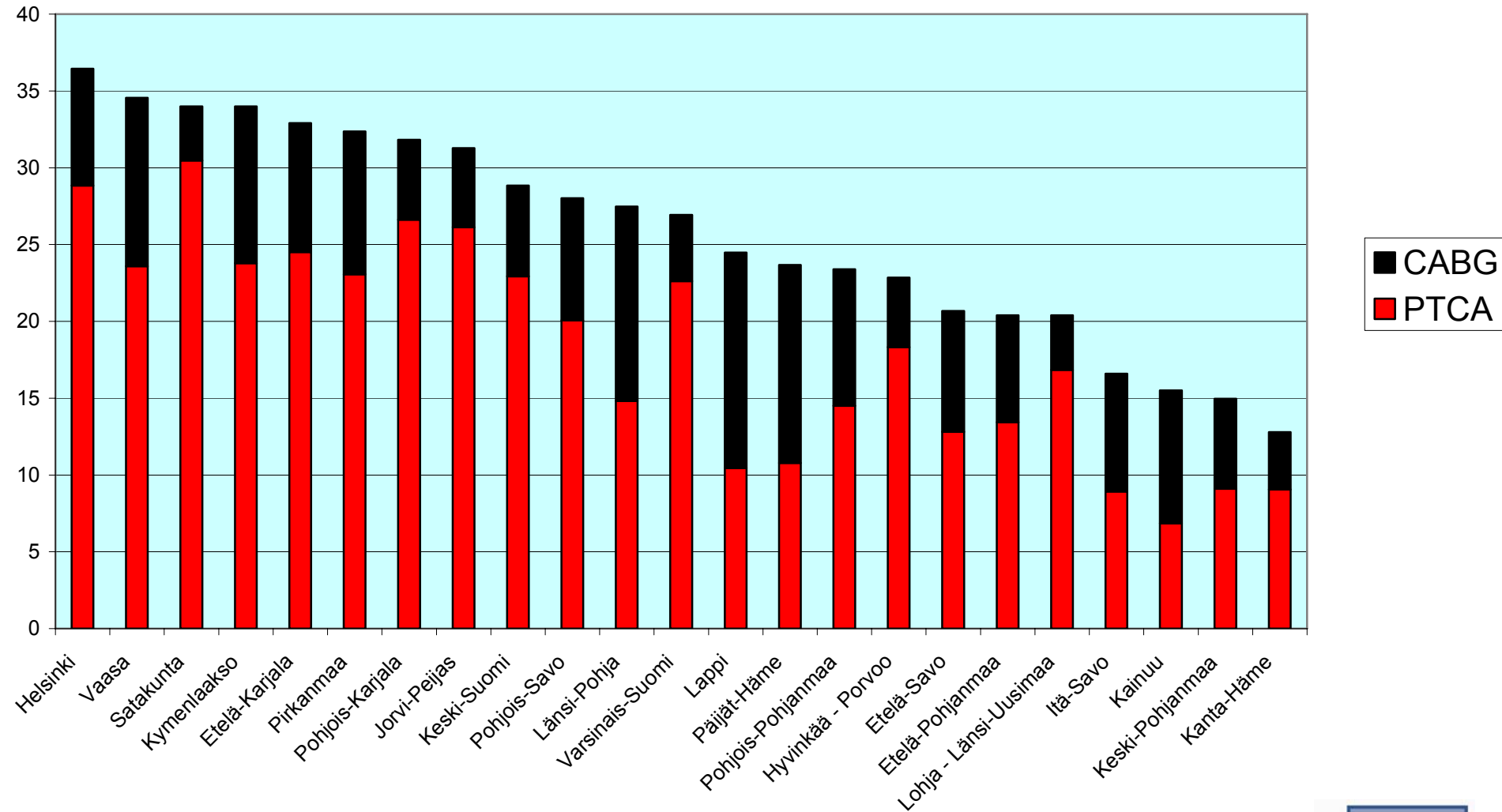
AMI (Acute myocardial infarctions)

Stroke (cerebral infarction)

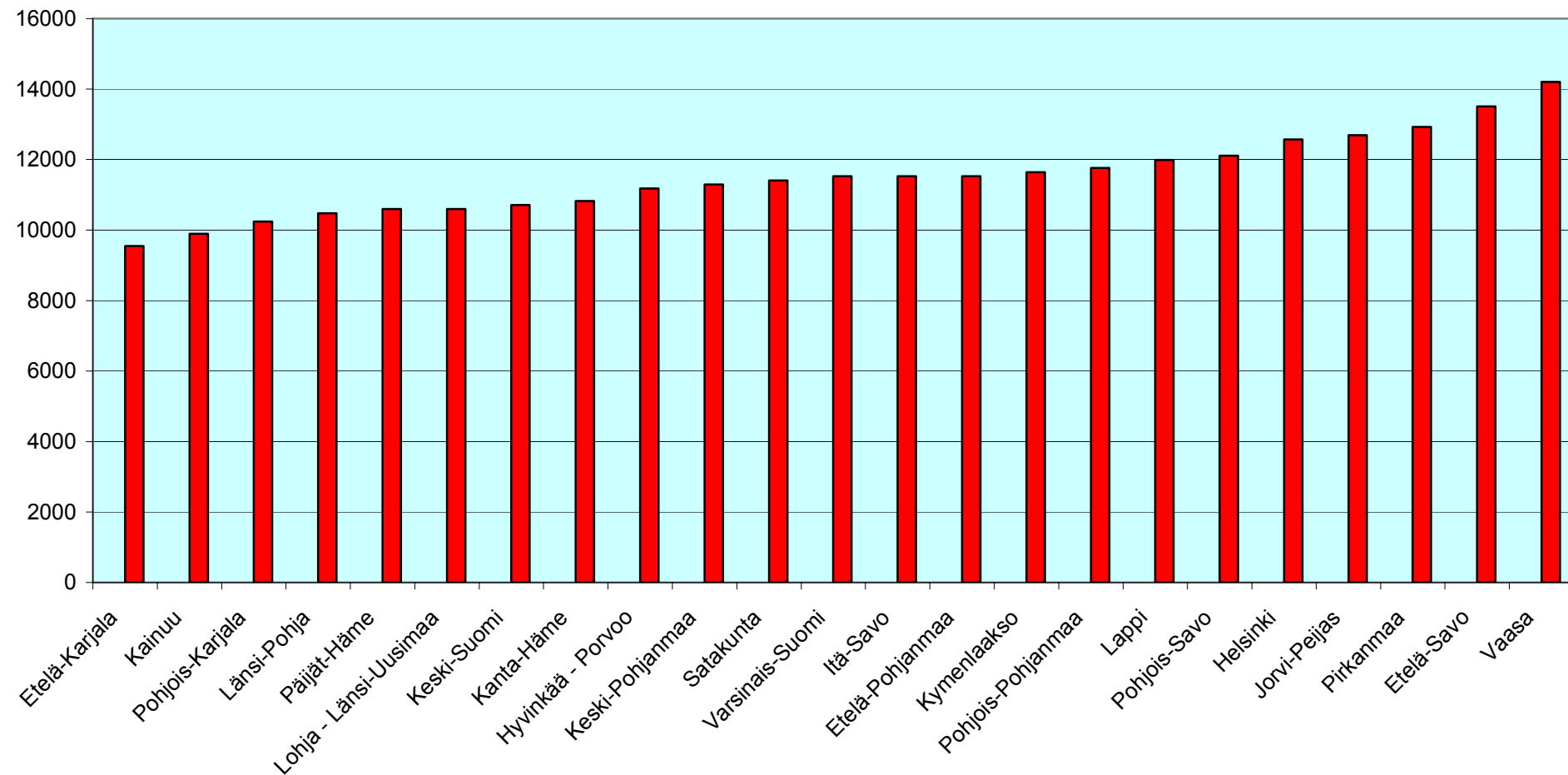
Infants born very prematurely

Hip and knee replacement

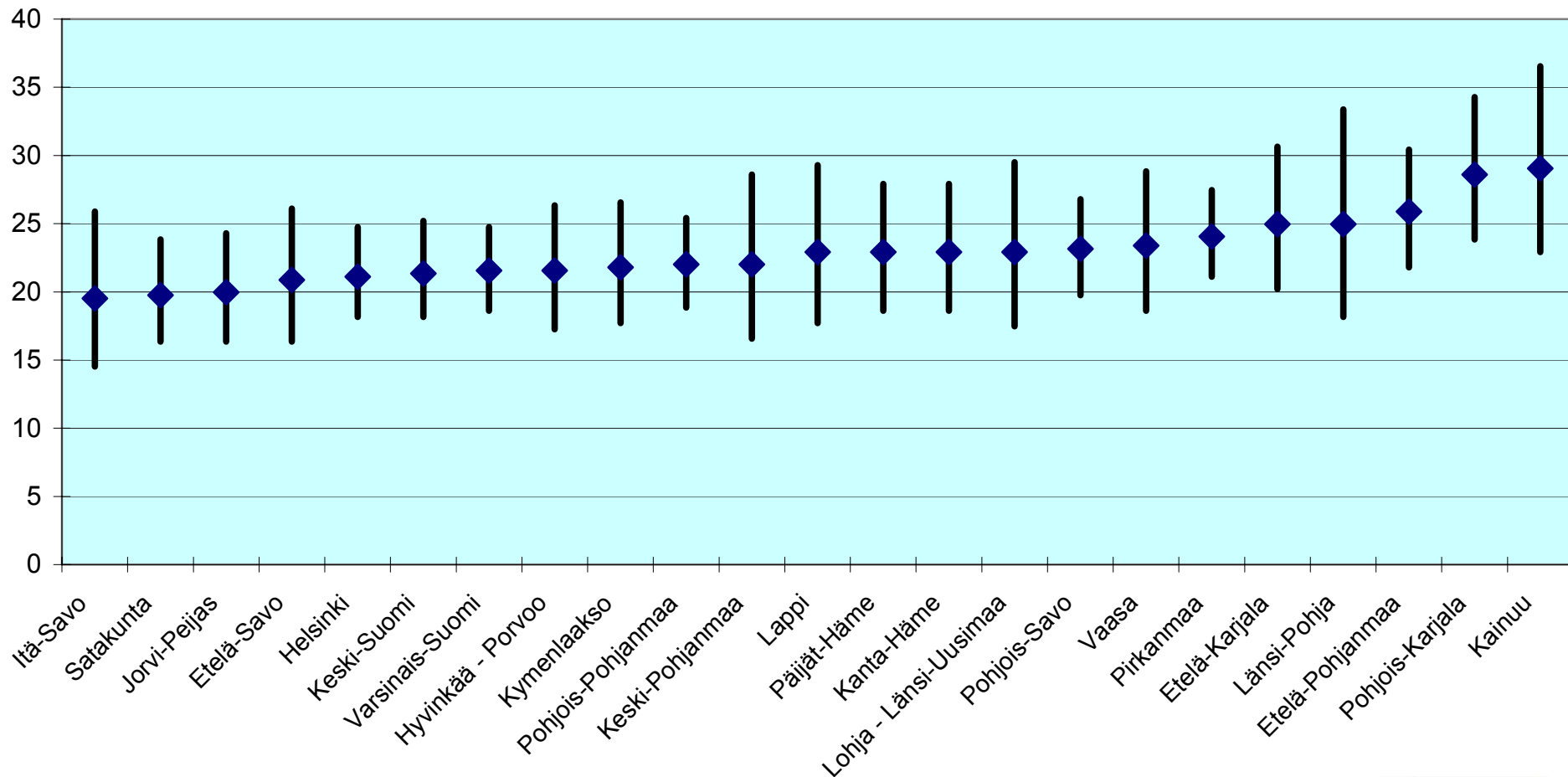
## Share of patients (%) for whom either PTCA or CABG has been performed within 30 days after infarct by hospital districts in 2003 (risk adjusted)



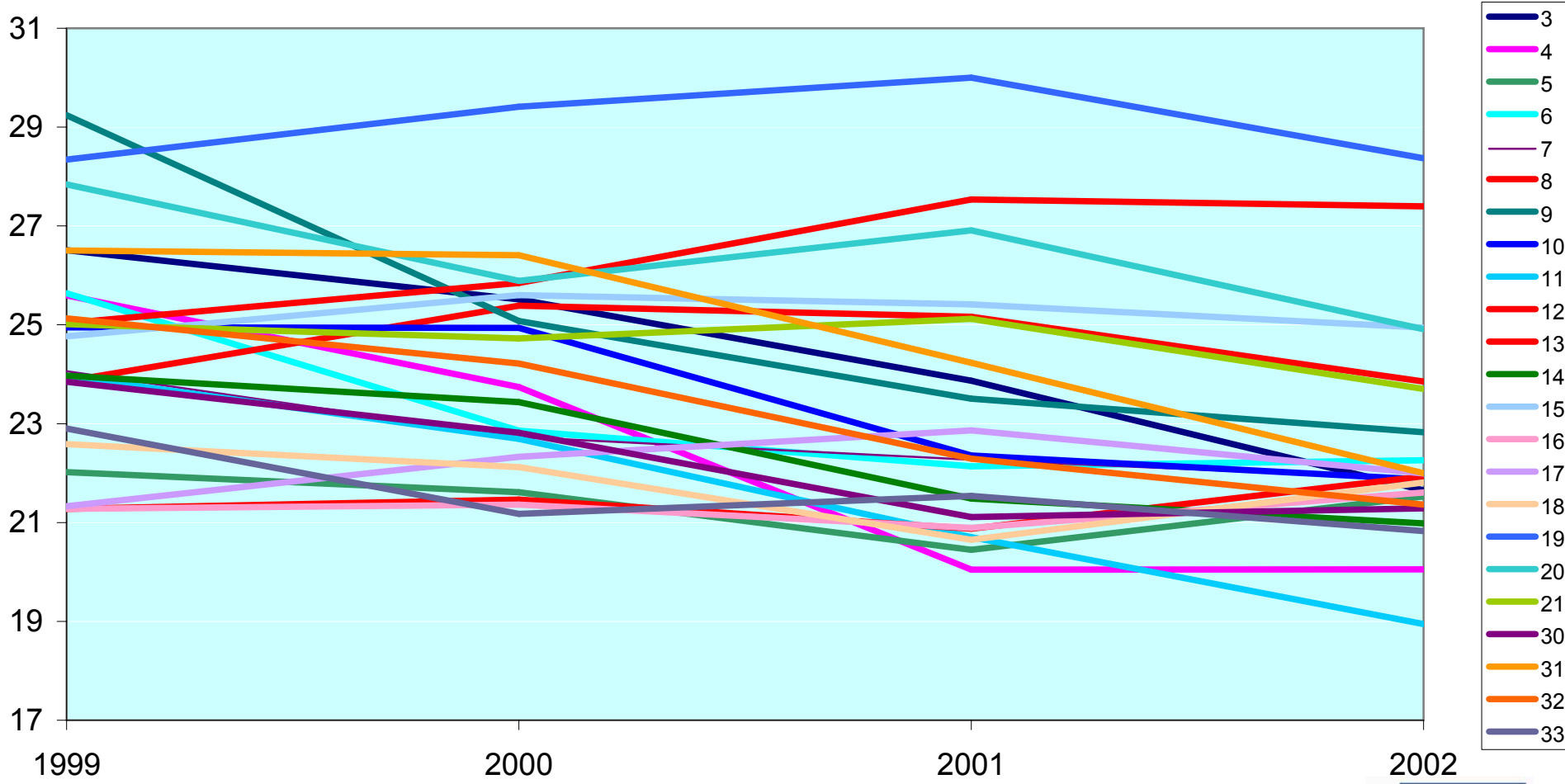
## One year cost of hospital care among AMI patients (€/patient) by hospital districts in 2003 (risk adjusted)



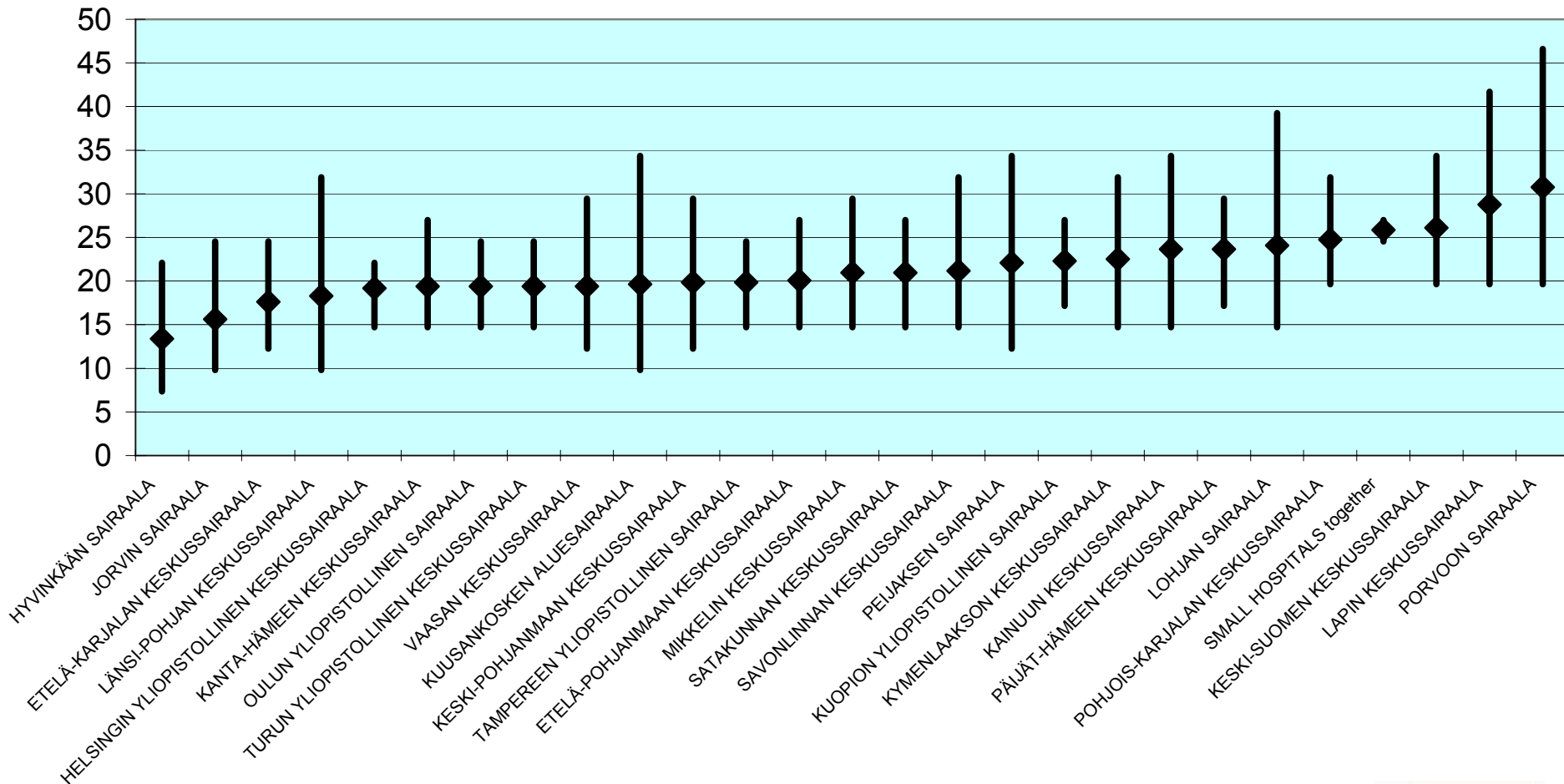
## One year mortality (%) of AMI patients by hospital districts, males 2002-2003 (risk adjusted, 95 % confidence intervals)



**One year mortality (%) of AMI patients by hospital districts  
(risk adjusted, three years moving average for males 1998-2003)**



## One year mortality of cerebral infarction patients by hospitals in 2003 (risk adjusted , 95 % confidence intervals)



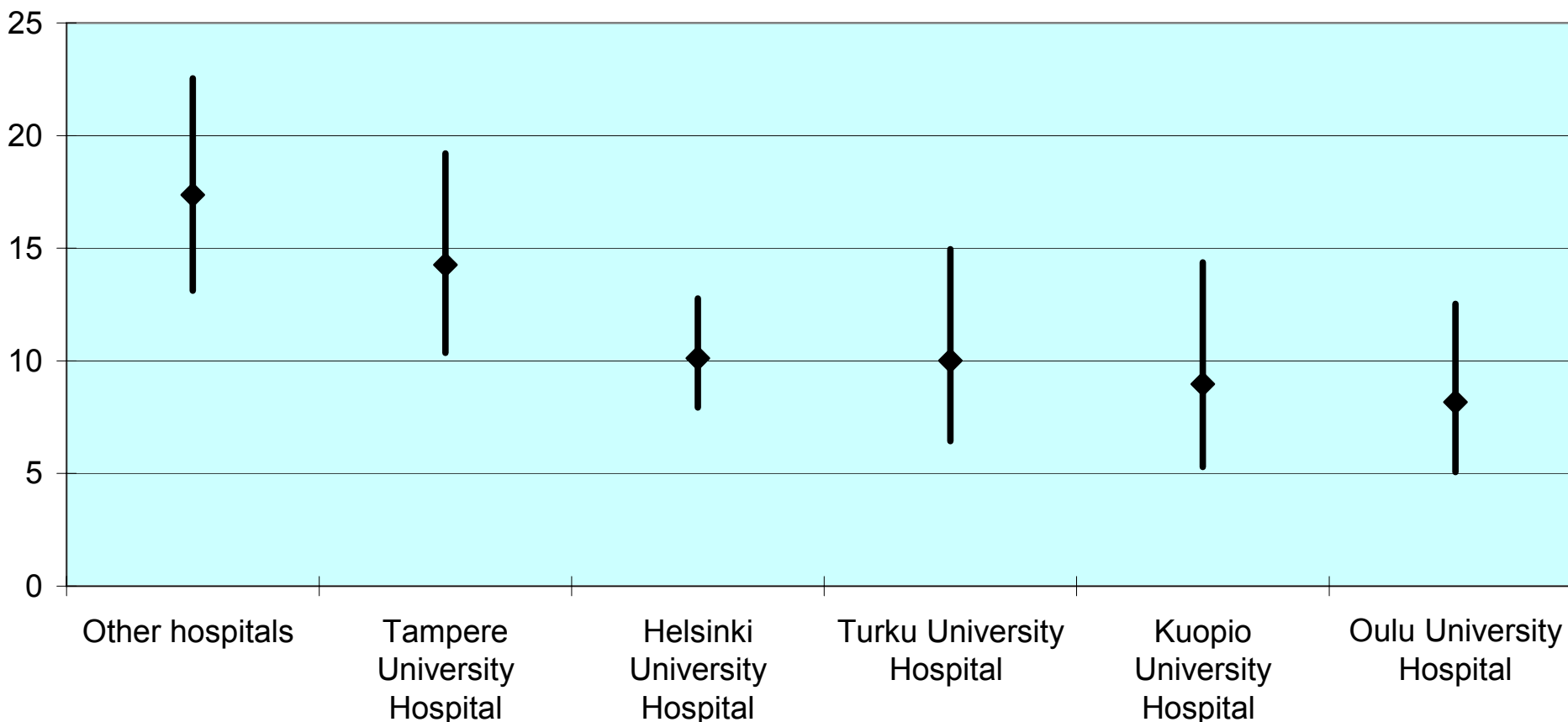
# Infants born very prematurely

All deliveries of very premature live born infants (gestational age below 32 weeks or birth weight < 1500 grams 2000-2003).

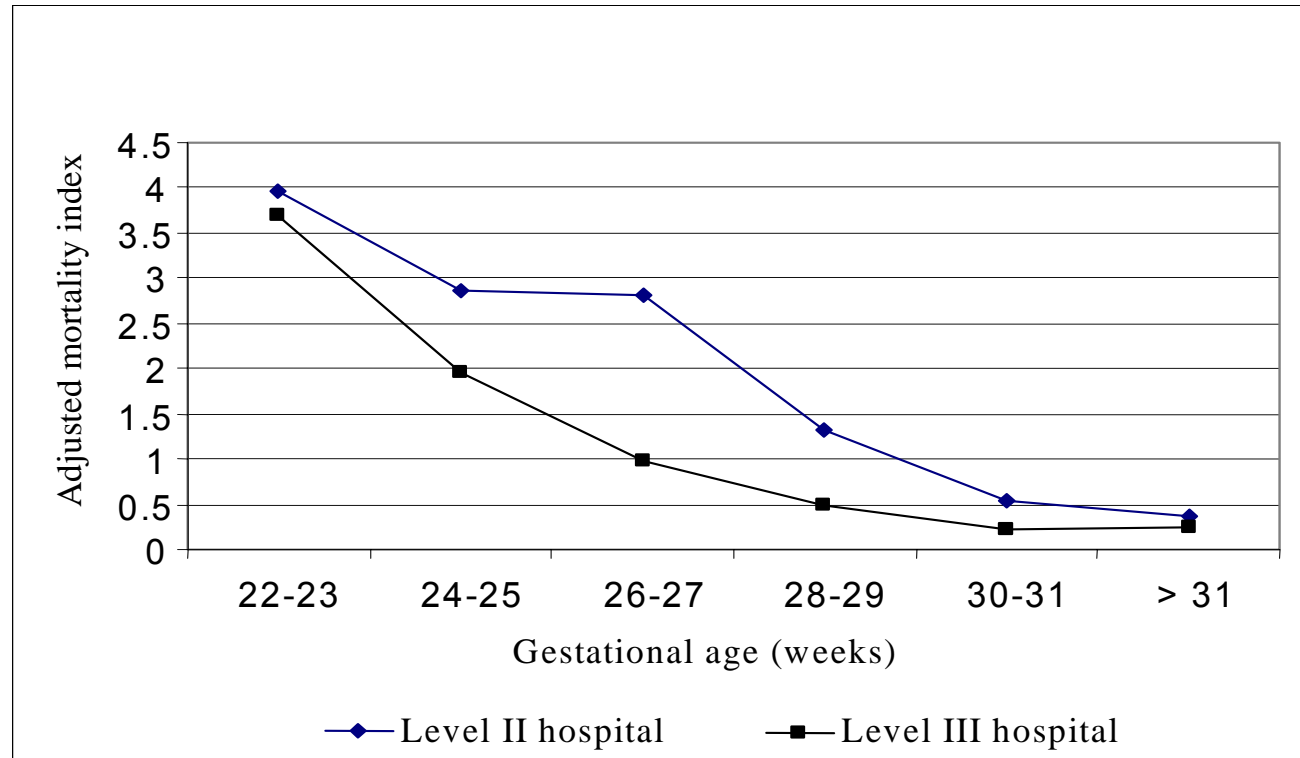
Infants with lethal congenial anomalies excluded

Risk adjustment (birth weight, gender, fetal growth, mothers age, mothers smoking, parity)

**One year mortality (%) of infants born very prematurely in five university hospitals and other hospitals 2000-2003.  
(risk adjusted, 95 % confidence intervals)**



## Adjusted one year mortality of infants born very prematurely between secondary level and tertiary (neonatal intensive care unit) level hospital by gestation age 2000-2003



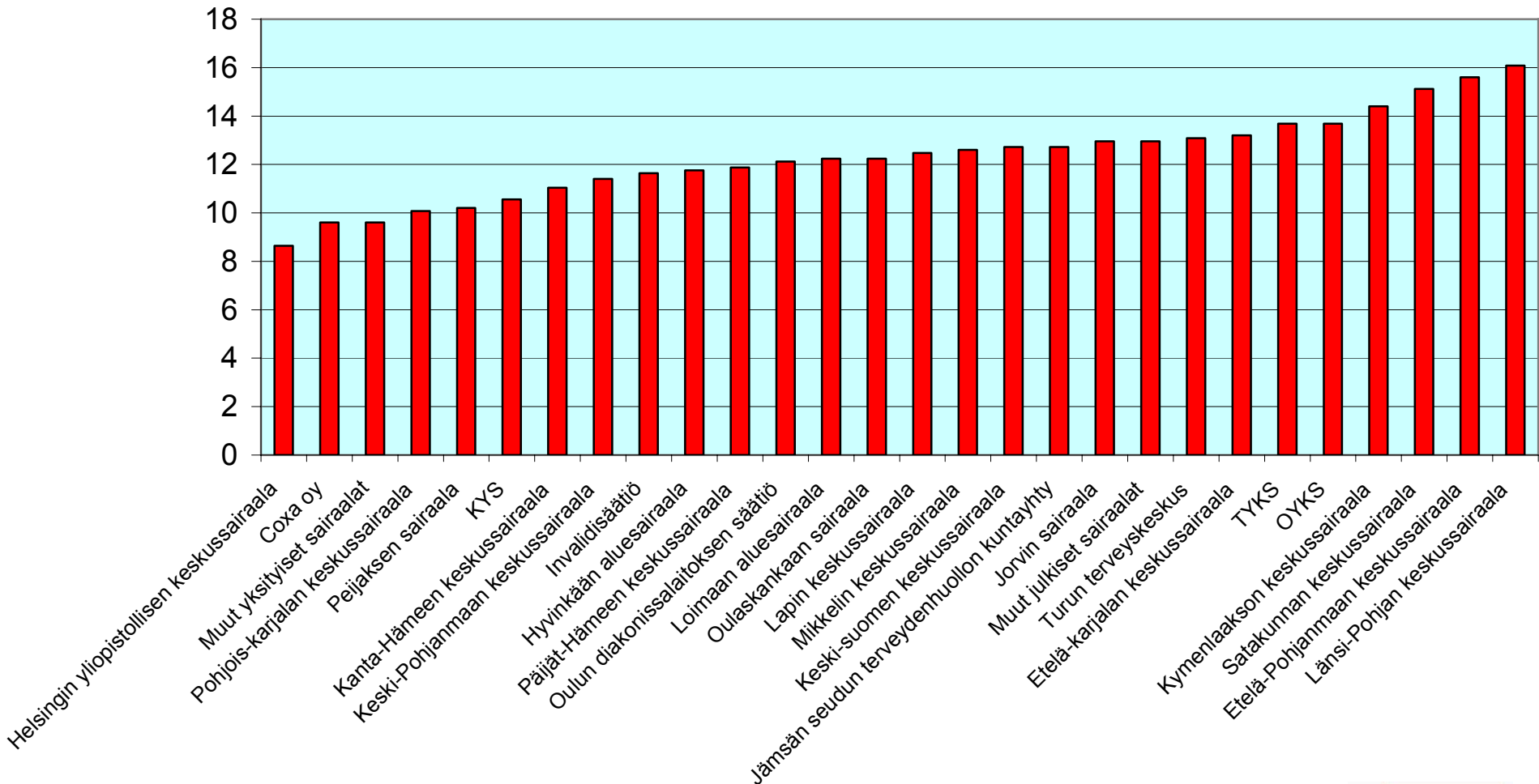
# Hip and knee replacements

## All replacements for primary arthrosis

**Risk adjustment** (age, sex, hypertension, coronary heart disease, atrial fibrillation, heart failure, diabetes, alcoholism, peripheral atherosclerosis, cancer, COPD and asthma, dementia, depression, Parkinson's disease, psychosis, renal failure, earlier operation of the same joint)

**Excluded if a person have had hospital admmission before replacmens for certain diagnoses**

## The average length of stay of whole hospital episode (operative admission + post surgical hospital care) among hip replacement patients by hospitals in 2003



# Conclusions

- The knowledge of the cost-effectiveness of a single (isolated) procedure is not enough to evaluate the outcome and performance of the health care system, we need to evaluate the whole treatment episode
- New dimension to benchmarking of care: data that directly helps the local decision-makers. They can compare their own performance not only by using cost or process indicators, but also outcomes and information on the relationship between costs, process and outcomes
- Next step. To evaluate factors that influence regional and hospital level differences of cost and outcome.

# Future challenges

- **New Possibilities:** Electronic patient record system. Not only a technological question. Needs at national level carefully planned definitions and classifications. Researchers should be involved in the definition of the data.
- Still much to work to improve the quality existing registers. Information on co-morbidity (secondary diagnoses ) and procedures is incomplete. Lack of data on outpatient services in primary health
- Problems in ICD-10. No information on recurrence of cancer. Makes outcome measurement difficult.

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